

Apple scab is a challenge to prevent and to predict

Fruit growers can buy support from Apple scab warning programmes, when to decide to spray or not. The programs predict the risk of scab infection in the orchard. But do they show the reality?

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Scab can be prevented by growing robust cultivars and not resistant cultivars, while resistance can last very short. This is 'Katrina' with Vf-resistance against apple-scab. The resistance is now broken by the scab fungus and the cultivar is now even very sensitive to scab.

In the GUDP project ProtecFruit, among other things we have tested the new method “Strategic Irrigation” to prevent Apple scab (*Venturia inaequalis*) in organic apples. Strategic irrigation does simply mean that you irrigate the orchard floor in dry periods during spring, 24 hours before rain forecast. Normally scab infections begin in spring, when rain elicits the overwintered ascospores to be ejected from the old leaves on the ground into the young leaves in the tree.

The strategic irrigation is meant to fool the ascospores to “think” it is raining, thus they will be ejected into a dry tree, and after 24 hours in dry weather, they’ll dry out without infecting and will be wasted. The aim is to deplete the stock of ascospores by strategic irrigations, and when it eventually rains, the potential of ascospores will be low.

It is a nice feeling to fool a fungus disease by just using water, but we have experienced that the scab fungus is not that easy to fool. In short, we have found a significant reducing effect of strategic irrigation, but very small, only a 4.4 % reduction. Such low effect is not sufficient to convince fruit growers to implement strategic irrigation in practice. The method relies on the occurrence of dry periods during the period of primary infection from April to mid-June, and that was not always the case. The Strategic Irrigation method will probably work better in combination with the use of organic approved fungicides.

During this work, we have used the scab warning programs Rimpro and its offshoot Fruitweb. These programs are working with local weather data and simulate the reactions of ascospores after rainfall, and predict the risk of scab infection. They are very popular and used by many apple growers as a useful tool to decide when to spray, and when not to spray. Unintendedly our work also became somewhat a test of these warning programs.

During our work with strategic irrigation we have studied a lot of ascospores. And our experience is, that the ascospores don’t always react, as the scab warning programs predict.

During the years 2015-2017 the programs did predict the periods with a risk of scab infection correctly. But the distribution of the ejected spores over time was not predicted well. By counting the real number of ejected spores after rain we found that the main part of the ascospores was ejected earlier than predicted. This suggests that when the program predicts a risk of 200 in April, the real picture might be a risk of 400, and the opposite situation in May-June. Provided, that our spore traps are showing the reality, this knowledge might be useful for Danish growers to keep in mind, when using the scab warning programs in the future.



Photo: Ascospore trap for monitoring the ejected ascospores in spring. Infected apple leaves are mounted under the glass slides, which are shifted after rain. The spores stick to the glass slides and are simply counted in a microscope.

We have also monitored the scab infection in different apple cultivars, and in our studies we have experienced that the scab risk level for the cultivars 'Red Aroma' and 'Ingrid Marie' is above the 300, which the program indicates as a normal threshold for risk of infection. In our studies even a predicted risk of 500 did not result in scab infections in these cultivars. In another trial orchard we found very low infections of apple scab in all years in the cultivars 'Red Aroma', 'Alkmene' and 'Holsteiner Cox', thus robust cultivars are essential in a production of unsprayed apples.

A summary of our work is:

that strategic irrigation alone does not sufficiently prevent apple scab, but might be a good supplement to fungicide sprays.

that the apple scab warning programmes might need an adjustment for Danish conditions, with more focus on the earliest infection periods before flowering.

that cultivars like 'Red Aroma', 'Alkmene' and 'Holsteiner Cox' are very robust against apple scab, with a maximum of 4% apple scab infection during 4 years of trial in an unsprayed orchard.

ProtecFruit is founded by GUDP by the Ministry of Environment and Food of Denmark, it is a part of the Organic RDD-2 programme, coordinated by ICROFS.

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